Title: Including or excluding conflicts of interest among expert peer reviewers had little impact on funding success**, a case study from Australia**

Abstract

Competition for research funding is intense and the opinions of an expert peer reviewer can mean the difference between success and failure in securing funding. The allocation of expert peer reviewers is therefore vitally important and funding agencies strive to avoid using reviewers who have real or perceived conflicts of interest. This article examines the impact of including or excluding peer reviewers based on their conflicts of interest, and the final ranking of funding proposals. Two 7-person review panels assessed a sample of National Health and Medical Research Council (NHMRC) of Australia proposals in Basic Science or Public Health. Using a pre-post comparison, the proposals were first scored after the exclusion of reviewers with a high or medium conflict, and re-scored after the return of reviewers with medium conflicts. The main outcome measures are the agreements in ranks and funding success before and after excluding the medium conflicts. Including medium conflicts of interest had little impact on the ranks or funding success. The Bland–Altman 95% limits of agreement were ± 3.3 ranks and ± 3.4 ranks in the two panels which both assessed 36 proposals. **Overall there were three proposals (4%)** that had a reversed funding outcome after including medium conflicts. Relaxing the conflict of interest rules would increase the number of expert reviewers included in the panel discussions which could increase the quality of peer review and make it easier to find reviewers.

Keywords: conflict of interest, peer review, research funding, decision making, assessment

Introduction

Health and medical researchers across the world submit their ideas to peer review to gain funding. Competition for research funding is intense, as success rates in most schemes are low and careers are on the line. The opinions of a peer reviewer can mean the difference between success and failure in securing funding and publications (Bornmann L. 2011). The allocation of peer reviewers is therefore vitally important and funding agencies strive to avoid using reviewers who have real or perceived conflicts of interest (Langfeldt L. 2006). Conflicted reviewers may unfairly raise or lower a proposal's score depending on their relationship with the applicant or institution, and this lack of fairness may be conscious or subconscious (Lamont M., Mallard G., and Guetzkow J. 2006; Osmond D.H. 1983).

The exclusion of reviewers with a conflict comes at a cost, as those most familiar with the field have greatest potential for conflict and potentially valuable opinions are lost. **Our previous study of the 2009 National Health and Medical Research Council of Australia found that 62% of proposals had at least one conflict, with a median of two conflicted reviewers from panels of 7 to 13 reviewers (Graves N., Barnett A.G., and Clarke P. 2011)**. There is anecdotal evidence that conflicts can, in some cases, exclude all qualified reviewers from the panel, leaving the remaining reviewers with insufficient expertise to assess the proposal. The US National Institutes of Health (NIH) has addressed these issues in biomedical research by relaxing the conflict of interest rules because the applicants and reviewers are often from the same institution (Shalev M. 2004). The revised NIH rules include a waiver of conflicts to ensure experts can remain on the review panel.

The key principles of peer review are that the process must be robust, fair and have transparency for conflicts (Braff J.P. 2010). There are varying levels of conflict of interest. An example of a high conflict would be a reviewer currently working with the applicant. An

example of a low conflict would be a reviewer currently working at the same institution, but who does not know the applicant. A study of conflict in funding peer review found that non-financial conflicts were the most common concern, with some of the key conflicts identified being between rival schools of thought, simple rivalry and geographic biases (Abdoul H. et al. 2012). The complexity of potential interactions in research life and individual researcher personalities means that there are no clear and universally applicable rules concerning which conflicts mean that the reviewer should be excluded (Abdoul H. et al. 2012; Shalev M. 2004).

There is a tendency for funding bodies to conservatively apply conflict rules, which can make it difficult to find qualified reviewers especially when proposal numbers are rising (Australian Government 2013; Schroter S., Groves T., and Højgaard L. 2010). Conflicts that exclude the most qualified expert reviewers from judging a proposal may be a source of randomness in funding decisions (Graves N., Barnett A.G., and Clarke P. 2011), as the remaining reviewers may have less knowledge of the applicant's field. Randomness may also be caused by the inconsistent application of conflict rules. The complexity of conflicts adds a subjective element to the review process, as the decision to exclude a reviewer somewhat depends on the interpretation of the rules and the degree of disclosure by the reviewer. There have been large studies on the impact of funding sources on the reporting of research findings in peer reviewed papers (DeAngelis C.D., Fontanarosa P.B., and Flanagin A. 2001; Friedberg M. et al. 1999)**, and studies of research funding have examined the effects of sexism and nepotism (Travis G.D.L., & and Collins H.M. 1991; Wenneras C, and Wold A. 1997)**, but there has been **little** empirical research into conflicts in research funding. This is a major gap in the evidence considering that evidence-based practice should be used at all stages of the research process.

This study of conflicts is a secondary part of a larger study investigating streamlined methods of peer review for funding research. Conflict of interest was examined for Project Grant

proposals submitted in 2013 to the National Health and Medical Research Council (NHMRC) of Australia. Project Grants are the major source of national funding for new projects. In 2013, the NHMRC funded 17% of the 3,821 Project Grant proposals, with a total budget of 420 million AU dollars (National Health and Medical Research Council 2013). The impact of conflicts on the peer review of funding proposals is examined using the inclusion or exclusion of peer reviewers based on their declaration of high or medium conflicts of interest. Our aims are to investigate how the current rules for excluding conflicts impacts on funding decisions, and how the average confidence of the panel changed when more reviewers were included in the discussion.

Methods

Study design

This study uses data from simplified peer review panels organised by the research team. The study was approved by the Queensland University of Technology Ethics Committee. For the applicants, submitting a proposal to the research team using email was accepted as consent to participate. All panel members provided written consent to participate and signed a Confidentiality Deed prior to their receipt of any proposals for peer review.

Expert review panels

Two 7-person panels reviewed a sample of NHMRC Project Grant proposals in separate 1.5 day face-to-face meetings. **The panel was allowed a maximum of 15 minutes to discuss each proposal. Each panel member was a spokesperson for five or six proposals, and they gave an opening summary of the strengths and weaknesses of the proposal based on a review they had prepared prior to the meeting. If a spokesperson declared a high conflict then that proposal was assigned to another spokesperson before the meeting.** The panels were convened in June 2013 before the official NHMRC panels (July–September

2013) and had no bearing on the actual awarding of funding (National Health and Medical Research Council 2013). The aim of the panels was to test a simplified process to review shortened proposals including a 9-page research plan and 2-page track record for each investigator.

The proposals were voluntarily provided to the research team by researchers who were approached **via email invitations sent through our existing networks from previous studies. Our sample was not randomly selected and therefore may be biased when extrapolating to the wider population. We received 145 proposals. We narrowed these down to the key fields of Basic Science and Public Health which had 36 and 38 proposals, respectively. We randomly removed two proposals from Public Health to give a total of 36.** Two panels **(one per field)** reviewed shortened versions of the proposals that were submitted to the official funding round, but were yet to be reviewed by the NHMRC. Before the discussion the panel chair asked all panel members if they had any real or perceived conflicts. Panel members who disclosed a high conflict (e.g., active collaborations with the investigators) or medium conflict (e.g., working at the same institute and had some past contact) were excluded, and those with a low or zero conflict remained on the panel (e.g., working at the same institute but have no contact with the investigators). These conflict rules were used to match the official peer review process (National Health and Medical Research Council 2014) **and 17 potential conflict of interest situations from the NHMRC are provided in the Appendix**. If the conflict ruling as medium or low level was uncertain, the panel member was asked if they felt they were able to give fair review, and they were excluded if they answered no.

Reviewers with a high conflict remained excluded for the entire discussion. Reviewers with a medium conflict were asked to first sit away from the remaining panel members; they were able to hear the discussion but not contribute (either verbally or non-verbally). The proposal

was discussed and scored by the non-conflicted reviewers. The medium conflicted reviewer(s) then returned, added to the discussion and the proposal was re-scored. Allowing the medium conflicted reviewer(s) to hear the original discussion avoided the need to provide a potentially incomplete summary of the initial discussion upon their return to the panel. **Proposals with one or more medium conflicts were scored twice, and all other proposals were scored once.**

Each proposal was scored according to the official NHMRC process using three criteria-based integer scores on a scale of 1 (low) to 7 (high) for: scientific quality; significance and innovation; and track record; and calculate an overall weighted score using 50:25:25%, respectively (National Health and Medical Research Council 2014). All scores were by secret written ballot **with no discussion of the overall score**.

Each reviewer was asked about their confidence in their score using the question: 'How confident were you that you were able to give this proposal a fair review based on your expertise and level of experience?' with three responses: 1) very confident; 2) confident; and 3) not confident. The aim of this question was to examine if the addition of panel members increased the group's confidence in their decision making.

Statistical analysis

The ranking of the 36 proposals for each panel was compared before and after conflicts were excluded. **The ranks were based on the mean scores using all available panel members.** We compared the ranks — not the scores — as the ranks are the key statistic that informs the decision-making process and determines whether a proposal is funded or not. Funding success was deemed as being ranked in the top 17% as this was the overall success rate in the 2013 NHMRC funding round (National Health and Medical Research Council 2013).

The change in ranking was visualised using the Bland–Altman plot and 95% limits of agreement (Bland J. and Altman D. 1986). To highlight any inconsistencies different plotting symbols were used for those proposals that would have been funded on: both occasions (before *and* after conflicts), on only one occasion (before *or* after conflicts), or on neither occasion.

Modelling confidence

An ordered categorical distribution was used to examine the average confidence of the reviewers (Dobson A.J. and Barnett A.G. 2008). We adjusted for the following factors that might impact on confidence: 1) review order of proposals, as confidence may have increased over time as reviewers became more familiar with the process; 2) academic level, as more senior reviewers may be more confident about their scores; and 3) **average** proposal score, as reviewers may be more confident about proposals that score very high or low, as these 'stand-out' proposals can be easier to assess. To model any remaining difference between reviewers a random intercept was included for each reviewer. We did not expect any of these factors to confound the association between conflicts and confidence.

We show the changes in confidence by plotting the predicted probabilities for a proposal with and without conflicts excluded. We expected the average confidence would increase after including conflicts due to the inclusion of more expertise. The strength and statistical significance of including conflicts was determined by the odds ratios of being in a higher confidence category. That is, moving from 'not confident' to 'confident', or from 'confident' to 'very confident'.

The R package (version 3.0.2) was used for **the conflict** analyses. The WinBUGS package (version 1.4.3) was used for the confidence model (Lunn D. et al. 2000).

Results

Medium conflicts impacted on 6 out of 36 proposals in the Basic Science panel and 8 out of 36 proposals in the Public Health panel; as a result, 17–22% of proposals were scored twice (Table 1). Summary statistics on the scores per proposal are given in Table 2. The mean scores for our study samples were higher than the official data from 2009, and the range in scores was also narrower.

The agreements in ranks before and after excluding medium conflicts are in Figure 1. The Bland–Altman 95% limits of agreement were ± 3.3 ranks for Basic Science and ± 3.4 ranks for Public Health. Most proposals only moved by a relatively small amount, however for two proposals in Public Health and one proposal in Basic Science this change was sufficient to change their funding success. One of the proposals with a different funding outcome did not have any conflicts, but their rank was dependent on other proposals with a conflict. The largest difference was a change of ± 6 ranks, which happened for three proposals across the two panels; although this relatively large change in ranks did not change the funding success.

The average confidences of the reviewers including and excluding medium conflicts are in Figure 2. There was an appreciable increase in confidence in Basic Science but only a minor increase in Public Health. The odds ratios for **a** higher confidence category after including conflicts were 2.04 (95% CI: 0.94, 4.56) in Basic Science and 1.16 (95% CI: 0.52, 2.66) in Public Health.

Discussion

We examined the impacts of conflicts of interest on the peer review of funding proposals. Our results show that in this case excluding conflicts did not impact greatly on the chances of funding success when using a controlled experiment (Figure 1). The absence of change could

be used to argue against the continued exclusion of medium conflicted reviewers in the official process. **An alternative interpretation of the results is that the small number of different decisions (3 out of 72 or 4%) is a large enough difference to mean that medium conflicts of interest do matter and should therefore continue to be excluded.**

Average confidence increased after including medium conflicted peer reviewers and allowing their participation in the panel discussion (Figure 2). If we assume that a more confident panel is likely to make better decisions, then including medium conflicts should give better results. However, some researchers may not agree with this assumption, as greater confidence is subjective and does not necessarily mean greater competence.

Excluding expert peer reviewers from our panels created missing data, a well-known problem in medical research. Missing data increases uncertainty because the variance in proposal ranks will increase as the sample size becomes smaller. It also adds an element of chance to funding success, as excluding reviewers who tend to give a higher or lower than average score will raise or lower a proposal's overall score (Johnson 2008). Such a change in score would be on the basis of conflicts and not on the quality of the proposal.

Strengths and limitations

A key strength of this study was the rare opportunity to convene experimental peer review panels to assess actual proposals and modify the conflict of interest rules.

The absence of evidence in our study of any difference in funding due to conflicts is not conclusive evidence of absence. This was a small study of just 72 proposals, and not every proposal had a conflict (Table 1). An alternative study design would be to have two duplicate experimental panels assessing the same set of proposals in which one panel is exposed to review with a conflict, while the other is not. The ideal study design would be to analyse the

impact of conflict on actual review panels awarding real funding, an unlikely design because the access to peer review data remains “closely guarded” (Carson L., Bartneck C., and Voges K. 2013; Couzin-Frankel J. 2013).

Our study has examined a relatively narrow range of conflicts of interest, and our findings may not apply to other types of conflicts. The declared conflicts were limited by the level of disclosure from the reviewers. It is possible that some reviewers withheld the full extent of their conflicts, but this cannot be confirmed, and such non-disclosure is **also** part of the official peer review process (National Health and Medical Research Council 2014).

The panel members were briefed on the objectives of the study prior to the panel discussions and they were aware of the experimental process that did not award actual funding. While this prior knowledge could have impacted on the behaviour of the panel members, the discussions were robust and divergent, and reported to be very similar to the official panels. The panel briefing included a discussion of the experimental process to initially exclude medium conflicts who remained in the room to listen to the original discussion. Their presence may have prevented some non-conflicted members from fully speaking their mind, e.g., due to a perceived hierarchy and power among reviewers based on seniority and expertise (Lamont M., Mallard G., and Guetzkow J. 2006; Osmond D.H. 1983). If medium conflicts were out of the room then there may have been more divergent views expressed, and the narrow limits of agreement in our results (Figure 1) may have become wider.

The mean scores were higher for our sample compared with official data from the NHMRC, and the range in scores was narrower (Table 2). The higher scores may be because the researchers who were willing to provide their proposals for experimental peer review were more senior. The narrower scores may indicate more agreement in our panels compared with

the official panels. Our panels had fewer members that the official NHMRC process, which is likely to reduce the number of divergent views.

Relaxing conflict rules

As excluding conflicts made little difference to funding success, then an argument could be made for relaxing the current strict conflict of interest rules. Funding agencies generally take a risk-averse approach to conflicts in order to avoid appeals and legal challenges which take valuable staff time. A potential consequence of this conservativeness is that the pool of available reviewers becomes too small (Bornmann L. 2011), especially in a relatively small research community like Australia (Australian Government 2013; Herbert D.L. et al. 2014). A relaxation of conflict rules will increase the number of reviewers included in the discussion, and increase the reliability between reviewers (Mutz R., Bornmann L., and Daniel H.-D. 2012).

Another argument for relaxing conflict rules is that more trust could be placed in the expert reviewers. The reviewers and panel chair should have the ability to see when someone with a declared conflict is unfairly talking a proposal up or down (Johnson V.E. 2008). A similar approach is required to deal with conflicts when reporting research findings and the declarations of any competing interests (Braff J.P. 2010; Smith R. 2006).

A conflict exists in peer review processes: on one side there is the requirement for fair and robust procedures to minimise the impact of conflicts, on the other side conflict of interest rules need to be sensible and easy to handle to avoid the reliance on non-expert peer reviewers with their own competing interests. Our results indicate that in a panel situation the conflict rules could be safely relaxed and that this would allow more experts to be included without harming fairness.

One way to avoid conflicts is to use more international reviewers (Abdoul H. et al. 2012). Australian funding agencies could swap reviews with another country, where each country reviews the other country's proposals. This has been tried between Italy and the USA (Van Noorden R. 2009), and by using an online panel process (Guthrie S. et al. 2013). Another technique for reducing conflicts is to use a completely anonymous system (Mervis J. 2007), although "completely anonymous" may be a misnomer as it is often possible to guess a proposal's author (Abdoul H. et al. 2012).

Conclusion

Dealing with conflicts of interest is a complex issue where opinions and peer review policies may be based on good and bad experiences. Excluding conflicts from a panel discussion can be at the cost of expert peer review, as there may be too few qualified but non-conflicted researchers remaining. This is especially true in small countries and small disciplines. Our results show that including medium conflicts did not greatly alter funding success. These results could be used to argue for a relaxation of conflict of interest rules to keep more experts on the peer review panel.

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Table 1 Frequency of conflicts for peer reviewers of Basic Science and Public Health proposals.

Panel	No conflict	Some medium conflicts	Only high conflicts	Total
	n (%)	n (%)	n (%)	n (%)
Basic Science	17 (47)	6 (17)	13 (36)	36 (100)
Public Health	21 (58)	8 (22)	7 (19)	36 (100)

Percentages may not add to 100 due to rounding.

Table 2 Summary statistics for weighted NHMRC scores from two simplified panels (excluding moderate conflicts) compared to the scores from all proposals submitted to the NHMRC in 2009. Q1 and Q3 are the first and third quartile.

Panel	N	**Mean**	**Q1, Q3 (range)**
Basic science	36	5.3	4.9, 5.6 (0.7)
Public health	36	4.8	4.2, 5.2 (1.0)
NHMRC	2705	4.4	3.8, 5.1 (1.3)

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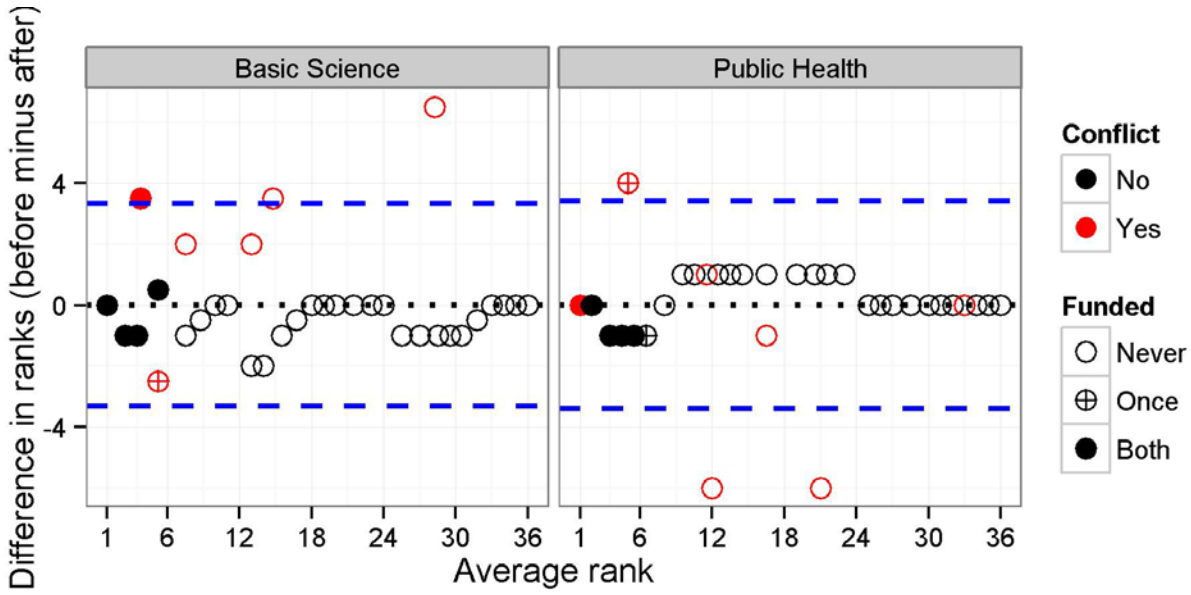

Figure 1 Bland–Altman plot showing the agreement in ranks before and after excluding conflicts of interest.

The y-axis shows the difference in ranks before and after conflicts, so a positive difference means the proposal was ranked higher after medium conflicts were included. The horizontal dashed lines are the Bland–Altman limits of agreement.

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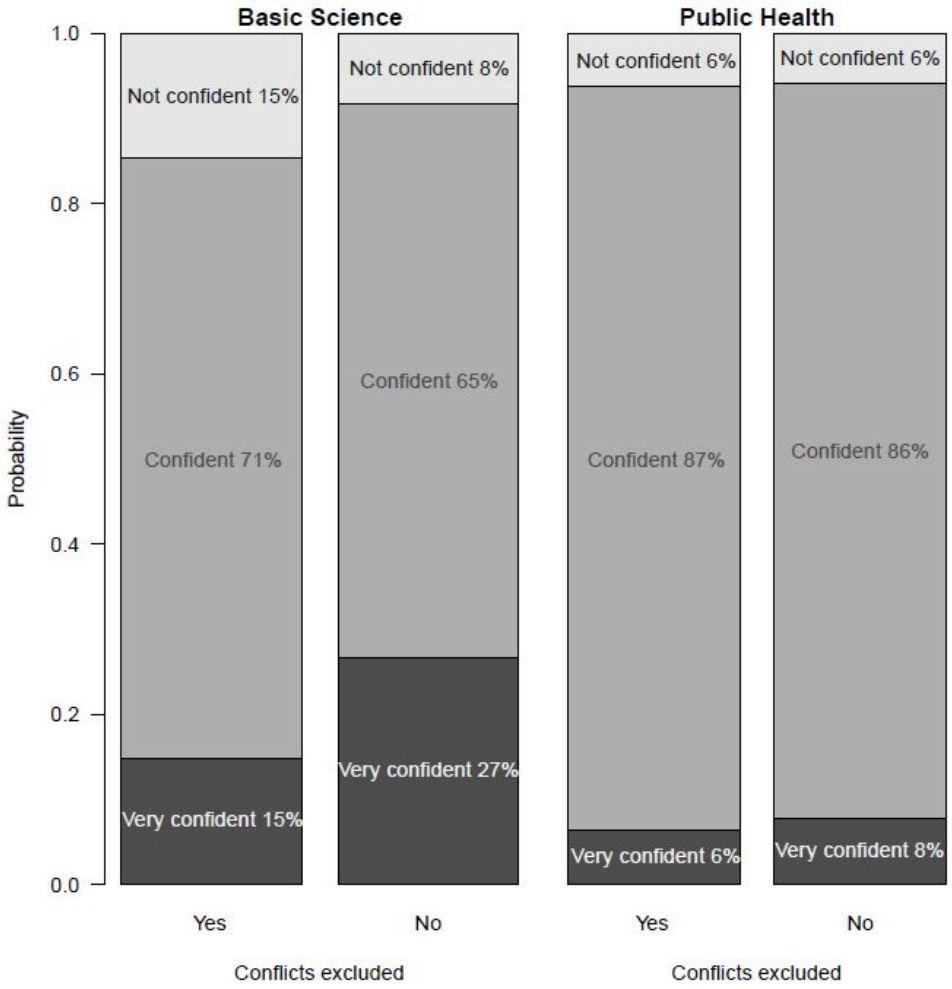

Figure 2 Panel members' average confidence in their own assessments, with and without including medium conflicted panel members in the discussion.

There was an appreciable increase in **average** confidence in Basic Science but only a minor increase in Public Health. Confidence increased after including medium conflicted peer reviewers and allowing their participation in the panel discussion.